Aedes (Stegomyia) simpsoni Complex in the Ethiopian Region with Lectotype Designation for *simpsoni* (Theobald) (Diptera: Culicidae)[1]

Yiau-Min Huang
Medical Entomology Project
Smithsonian Institution
Washington, D. C. 20560

ABSTRACT. An examination of the type-specimens of *Aedes (Stg.) simpsoni* (Theobald), *Ae. (Stg.) lilii* (Theobald), *Ae. (Stg.) bromeliae* (Theobald) and other available material indicates that *simpsoni* is a species complex. A lectotype female for *Aedes (Stegomyia) simpsoni* (Theobald) is designated, fully described and illustrated. Diagnostic characters for recognizing *simpsoni*, *lilii* and *bromeliae* females are presented. Characters for separating the *simpsoni* complex from other Ethiopian *Stegomyia* are also given.

INTRODUCTION

This paper clarifies the identity of *Aedes (Stegomyia) simpsoni* (Theobald) and focuses attention on the identification of 3 morphologically distinct forms which are currently treated as *Ae. simpsoni* in the Ethiopian region. It is hoped that this note will not only help the entomologist, epidemiologist, ecologist and other field workers to recognize the 3 forms but will also stimulate further investigations on ecology, behavior and transmission of yellow fever of each of these 3 forms in the various parts of the Ethiopian region.

This study has been based on specimens accumulated by the Medical Entomology Project (MEP), Department of Entomology, Smithsonian Institution and on specimens which were borrowed from individuals and institutions mentioned in the acknowledgments section.

TAXONOMIC DISCUSSION

Stegomyia simpsoni was originally described by Theobald (1905:224) from Transvaal, South Africa. Later, Theobald (1910:160) described *Stegomyia lilii* from Bor, Sudan and in the following year (1911:10) he described *Stegomyia bromeliae* from Kampala, Uganda.

Edwards (1912:11) considered *Aedes (Stegomyia) simpsoni* (Theobald) as a single species and synonymized both *lilii* and *bromeliae* with *simpsoni*. However, in a later discussion (Edwards 1941:134) on variation in *simpsoni*, he

[1]This work was supported by Research Contract No. DAMD-17-74-C-4086 from the U. S. Army Medical Research and Development Command, Office of the Surgeon General, Fort Detrick, Frederick, MD 21701.

recognized 2 forms of *simpsoni*; *simpsoni* sensu stricto, the type form, and *simpsoni* variety *lilii*. Since then, the synonymy of Edwards (1912, 1941) has been accepted without question, and the name *simpsoni* has been used for all *simpsoni*-like mosquitoes throughout the entire Ethiopian region. This has occurred because there is no literature that provides precise diagnostic characters for separating these closely related species and also because it is commonly accepted by most that any *simpsoni*-like mosquito is *simpsoni*.

Through the kindness of Drs. P. F. Mattingly and G. B. White, I have had the opportunity to examine type and other material of *Stegomyia* mosquitoes in the British Museum (Natural History). Six of Theobald's type-specimens of *simpsoni*, *lilii* and *bromeliae* were found. I take advantage of this opportunity to report on these 6 type-specimens with condition and data on labels of each as follows: *simpsoni*, male, in poor condition, palpus and proboscis absent, most scales on scutum rubbed off, hindtarsomeres 2-5 missing, 54f, (Recd. from F. V. Theobald, 1907-29), female, in good condition, 54p, (Recd. from F. V. Theobald, 1907-29); *lilii*, male, in very poor condition, with all but one hindleg missing, with associated terminalia on a plastic plate, Bor, Sudan, 26-V-1909, Harold King, (Recd. from F. V. Theobald, 1910-396), female, in good condition, Bor, Sudan, 26-V-1909, Harold King, (Recd. from F. V. Theobald, 1910-396); *bromeliae*, male, in fair condition, No. 21, Kampala swamp, Uganda, (Fraser and Baker, 1911.102), larva found in pineapple, 30-XI-1909, female, in fair condition, Kampala swamp, Uganda, (Fraser and Baker, 1911.102), larvae found in pineapples, 28-XI-1909.

It is desirable to give a detailed description of a lectotype female which I have selected, so that the identity of *simpsoni* should no longer remain in doubt.

The terminology of structural parts of the adult follows that of Belkin (1962) and Huang (1977).

Aedes (Stegomyia) simpsoni (Theobald)
(Fig. 1)

Stegomyia simpsoni Theobald 1905:224 (♂,♀). Type-locality: Nelspruit, Transvaal, South Africa.

Lectotype hereby designated: lectotype female, (54p), Nelspruit, Transvaal, 1904-5 (C. B. Simpson). Deposited in the British Museum (Natural History), London.

FEMALE (Fig. 1). *Head.* Proboscis completely dark scaled, slightly longer than forefemur; palpus about 0.2 length of proboscis, with white scales on apical half of the total length; torus covered with white scales except on dorsal and ventral sides; clypeus bare; erect forked scales pale, not numerous, restricted to occiput; a row of broad white scales around eye margins; vertex with a median stripe of broad white scales, with broad dark ones on each side interrupted by a lateral stripe of broad white scales, followed ventrally by a patch of broad white scales. *Thorax.* Scutum with narrow dark scales and a distinct median spot of broad white scales on anterior border, followed by a narrow submedian longitudinal stripe of narrow pale yellowish

scales on each side of midline, reaching to prescutellar bare space and connecting with prescutellar line of narrow white scales; a large patch of broader crescent-shaped white scales on fossal area; posterior dorsocentral white lines present, reaching to posterior 0.33 of scutum; a patch of narrow white scales on lateral margin just in front of wing root; acrostichal setae absent; dorsocentral setae present; scutellum with broad white scales on all lobes and with a few broad dark scales at apex of midlobe; anterior pronotum with broad white scales; posterior pronotum with a patch of broad white scales and a few narrow dark scales dorsally; paratergite with broad white scales; postspiracular area without scales; hypostigial area without scales; patches of broad white scales on propleuron, subspiracular area, upper and lower portions of sternopleuron, and on mesepimeron; upper sternopleural scale patch not reaching to anterior angle of sternopleuron; upper mesepimeral scale patch connecting with lower mesepimeral scale patch; lower mesepimeron without setae; metameron bare. *Wing*. With dark scales on all veins except for a minute basal spot of white scales on costa; cell R_2 2.0 length of R_{2+3}. *Halter*. With dark scales. *Legs*. Coxae with patches of white scales; white knee-spot absent on forefemur, present on mid- and hindfemora; forefemur anteriorly with a narrow, white longitudinal stripe on basal ventral 0.33; midfemur with a large, white spot on basal 0.67 of anterior surface; hindfemur anteriorly with a broad, white longitudinal stripe which widens at base and on basal 0.67; foretibia anteriorly dark, with a basal white band; mid- and hindtibiae all dark; fore- and midtarsi with a basal white band on tarsomeres 1,2; foretarsomere 1 with basal 0.3 white on dorsal surface; foretarsomere 2 all white except apical 0.1 on dorsal surface; midtarsomere 1 with basal 0.4 white on dorsal surface; midtarsomere 2 all white except apical 0.1 on dorsal surface; hindtarsus with a basal white band on tarsomeres 1-3, the ratio of length of white band on dorsal surface to the total length of tarsomere is 0.33, 0.50, and 0.75; tarsomere 4 all dark; tarsomere 5 all white; fore-, mid- and hindtarsi with claws equal, all simple. *Abdomen*. Segment I with white scales on laterotergite; terga II-VII each with a basal white band and basolateral white spot which do not connect; sterna III-VI each with a basal white band; sternum VII with basolateral white spots; segment VIII largely retracted.

A comparison of some morphological features of Theobald's 6 type-specimens is given in Table 1. The number is the ratio of length of basal white band to the total length of tarsomere on dorsal surface (Figs. 2,3) and the number in parentheses is the basal white stripe on posterior surface (Fig. 4). Female tarsal claws are illustrated (Fig. 5).

A *simpsoni* ♂ (GA-6/12, South Africa, Transvaal, Tzaneen, X-1973, B. de Meillon) from South Africa obtained from a progeny rearing in which all the females agree well with the lectotype female, is used for illustration of the morphological features of the legs since the type-specimen of *simpsoni* ♂ has hindtarsomeres 2-5 missing.

A *lilii* ♂ (1952/140, Uganda, Kavamoja Prov., Kaabong Rock, 1952, A. J. Haddow, from *Sanseriera* axils) from Uganda is used for illustration of the morphological features of the legs since the type-specimen of *lilii* ♂ lacks fore- and midlegs. At present, no other specimens from Sudan, which is the type-locality of *lilii*, are available. In addition, since Uganda is the type-locality of *bromeliae* and there is a *lilii* ♀ (1952/152) with the same data from Uganda that agrees well with the type-specimen of *lilii* ♀ from Sudan, the latter specimen is used for illustrating *lilii* ♀.

The morphological features of the *simpsoni* ♂ from South Africa and *lilii* ♂ from Uganda are also given in Table 1.

Table 1. Morphological features of Theobald type-specimens and related material in the *Aedes simpsoni* complex.

			Foretarsomere 1	Foretarsomere 2	Midtarsomere 1	Midtarsomere 2
Type-specimens						
simpsoni	♀	(Fig. 2)	1/3	9/10	2/5	9/10
	♂		1/5	1/2	2/5	2/3
lilii	♀	(Fig. 2)	1/6	2/5	1/3	1/2
	♂		—	—	—	—
bromeliae	♀	(Figs. 2,4)	1/5	1/2	1/3 (4/5)	2/3 (3/4)
	♂	(Figs. 3,4)	1/4 (4/5)	1/2 (2/3)	1/3 (5/6)	2/3 (3/4)
Other specimens						
simpsoni (South Africa)	♂	(Fig. 3)	1/5	4/5	1/3	7/8
lilii (Uganda)	♂	(Fig. 3)	1/6	1/3	1/3	2/5

		Hindtarsomere 1	2	3	4	5	Fore- and midtarsal claws
Type-specimens							
simpsoni	♀	1/3	1/2	3/4	all dark	all white	equal, both simple
	♂	1/3	—	—	———	———	unequal, both simple
lilii	♀	1/3	1/3	1/2	all dark	all white except tip	equal, both toothed
	♂	1/4	1/3	1/2	all dark	2/3	———
bromeliae	♀	1/3	2/5	3/5	all dark	all white except tip	equal, both toothed
	♂	1/3	2/5	3/5	all dark	4/5	unequal, both simple
Other specimens							
simpsoni (South Africa)	♂	1/3	2/5	2/3	all dark	all white	unequal, both simple
lilii (Uganda)	♂	1/4	1/3	2/5	all dark	2/3	unequal, both simple

A careful study of Theobald's type-specimens of *simpsoni*, *lilii* and *bromeliae* seems to show that what is commonly called *Aedes simpsoni* consists of 3 species. This is further demonstrated by an examination of the existing adult specimens identified as *Aedes simpsoni* from various European museums. The morphological differences exhibited in the adult stage indicate that *Aedes simpsoni* is highly complex, consisting of several closely related, variable species. Thus, a large number of individually reared specimens with

definitely associated larval and pupal skins, as well as specimens of progeny rearing obtained from a single female from many different localities will be necessary to resolve the taxonomic status of the various species of this complex.

The *Aedes simpsoni* complex has attracted considerable attention. Gerberg and Hartberg (1975) gave a list of some 137 bibliographic references to *simpsoni*. In order to clarify the situation and in view of the present interest in the *simpsoni* complex due to its medical importance, it is now considered desirable to give diagnostic characters for distinguishing *simpsoni*, *lilii* and *bromeliae* females. It is hoped that this presentation will encourage workers in Africa to collect more material that will be available to us so that further reliable diagnostic characters can be found to separate these species in all stages.

The *Aedes simpsoni* complex can be distinguished from other *Stegomyia* in the Ethiopian region by the following combination of characters: (1) prescutellar area without broad, flat, metallic silvery white scales; (2) scutellum with broad white scales on all lobes; (3) white knee-spot absent on forefemur, present on mid- and hindfemora; (4) midfemur with a large, white spot on anterior surface; (5) hindtibia without a white stripe at, or near, base; (6) hindtarsomere 4 entirely dark.

Members of the *simpsoni* complex are extremely similar and difficult to separate. However, certain characters are constant and unique and can be used to distinguish one from the other. At present, 3 common and morphologically distinct adult females are found in the Ethiopian region: *simpsoni*, *lilii* and *bromeliae*. Thus, at present, at least the original 3 Theobald species can be recognized within this complex. The diagnostic characters and known distribution (based on the specimens which I have examined) of the species of the *simpsoni* complex are summarized in Table 2.

Table 2. Female diagnostic characters and distribution of species in the *Aedes simpsoni* complex.

Species	Female Diagnostic Characters	Distribution
simpsoni (Theobald, 1905)	1. Fore- and midtarsal claws equal, both simple; 2. Fore- and midtarsomere 2 with basal 0.83-0.90 white on dorsal surface; 3. Midtarsomere 1 usually without a white stripe on posterior surface.	South Africa
lilii (Theobald, 1910)	1. Fore- and midtarsal claws equal, both toothed; 2. Fore- and midtarsomere 2 with at most basal 0.50 white on dorsal surface; 3. Midtarsomere 1 usually without a white stripe on posterior surface.	Central African Empire, Ethiopia, Ghana, Ivory Coast, Liberia, Nigeria, Sudan, Uganda, Upper Volta, Comores Is.

Table 2 (cont.)

Species	Female Diagnostic Characters	Distribution
bromeliae (Theobald, 1911)	1. Fore- and midtarsal claws equal, both toothed; 2. Foretarsomere 2 with basal 0.50 white on dorsal surface; midtarsomere 2 with basal 0.66-0.75 white on dorsal surface; 3. Midtarsomere 1 with a white stripe, on basal 0.75-0.83, on posterior surface; midtarsomere 2 with at least basal 0.66 white on posterior surface.	Angola, Cameroon, Central African Empire, Congo, Guinea, Kenya, Liberia, Malawi, S. Rhodesia, Sierra Leone, Tanzania, Uganda, Upper Volta, Comores Is.

It is evident that Edwards' (1941) concept of considering *Aedes simpsoni* as a single species is incorrect. It is also evident that the synonymy of both *lilii* and *bromeliae* with *simpsoni* by him is not justified. Since the female of both *lilii* and *bromeliae* has both claws toothed on the fore- and midlegs while the female of *simpsoni* has both claws simple on the fore- and midlegs, and there is no clinal variation in claw structure as in *Aedes caspius* (Pallas) given by Mattingly and Knight (1956:99) in all specimens I have seen, this appears a good character for separating *simpsoni* from *bromeliae* and *lilii*. It should be noted that the description of the legs of female *bromeliae* given by Theobald (1911:11), . . . "ungues equal and simple;" is in error, and that the variation given by Edwards (1941:134) for his 2nd form, var. *lilii* . . . "the claws of the front and middle legs of the female are usually (not always) toothed," could be from this publication. Thus, it would seem appropriate to use *simpsoni* complex for all *simpsoni*-like mosquitoes in the Ethiopian region, and to retain both the names *lilii* and *bromeliae* for two of its species. There are other morphological forms found within this complex. However, since no previous names have been applied, they will not be now discussed.

Members of the *Aedes simpsoni* complex in the Ethiopian region are being investigated further and the full results will be published in due course.

MEDICAL IMPORTANCE AND ADULT BIONOMICS

In 1941, yellow fever virus was isolated from a human patient and wild-caught mosquitoes (*Ae. simpsoni*) in Bwamba County, Western Province, Uganda. Since then, entomological work in Bwamba has intensified. Several outstanding investigations were conducted in Uganda by Gibbins (1942), Haddow (1945a, 1945b, 1948, 1950), Gillett (1951, 1955), and Mukwaya et al. (1971). As we now know that both *lilii* and *bromeliae* occur in Uganda, it is not possible to say what those "*simpsoni*" represent without examination of the aforementioned specimens. However, the specimens of Bwamba County identified by Haddow et al. (1951:218) as *simpsoni* are not *simpsoni*. They are probably *bromeliae* judging from the characters given by Haddow et al. (1951:219). There is a possibility that they are *lilii* since the markings on the thorax and abdomen are highly variable and the leg markings were not given.

In Uganda, Gillett (1951:119) found *simpsoni* occurring as both human-biting and non-human-biting populations, and that all the former were found at altitudes below and all the latter at altitudes above 1,150 m. After a further study on the biting behavior of *simpsoni* in Uganda, Gillett (1955: 155) concluded, "It would appear reasonable at present to regard the anthropophilic and non-anthropophilic populations of *A. simpsoni* as separate races, even though it has not so far been possible to associate this variation in behaviour with any morphological differences." He also suggested, "Isolation may be an important factor in bringing about such variation; plantations suitable for the breeding of *A. simpsoni* are often separated by many miles of unsuitable country, and the species is probably split up into very many discrete non-interbreeding populations."

The present findings on the morphological differences among the members of the *Aedes simpsoni* complex give further confirmation to Gillett's (1955) conclusion. It may well prove that Gillett's (1951) human-biting and non-human-biting populations are, in fact, 2 distinct species when those specimens become available for a careful examination. The present observations also agree with Pajot (1976) who noted that central African *simpsoni* are related to east African forms and not to South African ones (see known distribution).

CONCLUSION

Based on the present collection data *simpsoni* appears to be restricted to South Africa. This may be largely due to the isolation by a dry belt in southern Rhodesia and Mozambique as pointed out by Mattingly (1952:286 and Fig. 12). *Aedes bromeliae* is a common species widespread in most parts of the Ethiopian region while *lilii* seems to be less prevalent. This may be due to the differences in biting behavior and/or preference for other hosts rather than man.

It is concluded that both *lilii* and *bromeliae* which have females with toothed tarsal claws, be removed from synonymy with *simpsoni* which has the female with all tarsal claws simple, and restored to specific status. This course of action is taken even though the only good characters for separating *lilii* from *bromeliae* are markings on the legs (associated immature stages of both *lilii* and *bromeliae* are not available for study at this time). Should these morphological characters prove to be variable (and no other diagnostic characters can be found in the immature stages of *lilii* and *bromeliae*) when more adequate material becomes available, which I rather doubt, then, *bromeliae* will have to be placed in synonymy with *lilii*.

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to Dr. Ronald A. Ward, Dr. G. B. White and Mr. E. L. Peyton for a critical review of the manuscript and for their valuable comments.

I am most grateful to Dr. P. F. Mattingly and Dr. G. B. White, Department of Entomology, British Museum (Natural History), London, for the loan of type-specimens of *Stegomyia simpsoni*, *Stegomyia lilii* and *Stegomyia bromeliae*

and other material in the British Museum; to Dr. W. W. Macdonald and Mr. J. Lane, Department of Entomology, London School of Hygiene and Tropical Medicine, London; Dr. L. Matile, Museum National d' Histoire Naturelle, Paris; Dr. F. Rodhain and Miss C. Perez, Institut Pasteur, Paris, Dr. J. Mouchet and Dr. A. Rickenbach, Services Scientifiques Centraux de 1' O.R.S.T.O.M., Bondy, France; Dr. J. Decelle and Dr. R. Jocque, Department of Zoologie, Section d' Entomologie, Musee Royale de 1' Afrique Centrale, Tervuren, Belgium; for the loan of the specimens used in this study. The Angola material from Dr. H. Ribeiro and Dr. H. da Cunha Ramos, Cadeira de Entomologia, Instituto de Higiene e Medicina Tropical, Lisboa, Portugal; the South African material from Dr. C. A. Green and Mr. J. Muspratt, Department of Medical Entomology, The South African Institute for Medical Research, Johannesburg, South Africa, are acknowledged with sincere appreciation. I wish to also thank the following additional institution for the loan of material: United States National Museum.

Special thanks are given to Mr. Young T. Sohn for preparing the drawings and to Mrs. Sharon G. Harrison for typing the manuscript for offset reproduction.

LITERATURE CITED

Belkin, J. N. 1962. The mosquitoes of the South Pacific (Diptera, Culicidae). Univ. Calif. Press, Berkeley and Los Angeles, 2 vols., 608 and 412 p.

Edwards, F. W. 1912. A synopsis of the species of African Culicidae, other than *Anopheles*. Bull. Entomol. Res. 3:1-53.

_____. 1941. Mosquitoes of the Ethiopian region. III. Culicine adults and pupae. Br. Mus. (Nat. Hist.), London, 499 p.

Gerberg, E. J. 1972. The type locality of *Aedes (S.) simpsoni* (Theobald). Mosq. Syst. 4:9.

Gerberg, E. J. and W. K. Hartberg. 1975. A bibliography of *Aedes simpsoni* (Theobald). Mosq. Syst. 7:137-47.

Gibbins, E. G. 1942. On the habits and breeding-places of *Aedes (Stegomyia) simpsoni* Theobald in Uganda. Ann. Trop. Med. Parasitol. 36:151-60.

Gillett, J. D. 1951. The habits of the mosquito *Aedes (Stegomyia) simpsoni* Theobald in relation to the epidemiology of yellow fever in Uganda. Ann. Trop. Med. Parasitol. 45:110-21.

_____. 1955. Further studies on the biting behaviour of *Aedes (Stegomyia) simpsoni* Theobald in Uganda. Ann. Trop. Med. Parasitol. 49:154-7.

Haddow, A. J. 1945a. The mosquitoes of Bwamba County, Uganda. II. Biting activity with special reference to the influence of microclimate. Bull. Entomol. Res. 36:33-73.

_____. 1945b. The mosquitoes of Bwamba County, Uganda. III. The vertical distribution of mosquitoes in a banana plantation and the biting cycle of *Aedes (Stegomyia) simpsoni* Theo. Bull. Entomol. Res. 36:297-304.

_____. 1948. The mosquitoes of Bwamba County, Uganda. VI. Mosquito breeding in plant axils. Bull. Entomol. Res. 39:185-212.

_____. 1950. A note on the occurrence of *Aedes (Stegomyia) simpsoni* Theobald in the canopy of rain-forest in Bwamba County, Uganda. Ann. Trop. Med. Parasitol. 44:238-41.

Haddow, A. J., E. C. C. Van Someren, W. H. R. Lumsden, J. O. Harper and J. D. Gillett. 1951. The mosquitoes of Bwamba County, Uganda. VIII. Records of occurrence, behaviour and habitat. Bull. Entomol. Res. 42: 207-38.

Huang, Y.-M. 1977. Medical entomology studies - VII. The subgenus *Stegomyia* of *Aedes* in Southeast Asia. II. - The *edwardsi* group of species. III. - The *w-albus* group of species (Diptera: Culicidae). Contrib. Am. Entomol. Inst. (Ann Arbor) 14(1):1-111.

Mattingly, P. F. 1952. The sub-genus *Stegomyia* (Diptera: Culicidae) in the Ethiopian Region. I. A preliminary study of the distribution of species occurring in the West African sub-region with notes on taxonomy and bionomics. Bull. Br. Mus. (Nat. Hist.), Entomol. 2:233-304.

Mattingly, P. F. and K. L. Knight. 1956. The mosquitoes of Arabia. I. Bull. Br. Mus. (Nat. Hist.) Entomol. 4:89-141.

Mukwaya, L. G., A. Kitama, C. Mawejje and C. Ssaku. 1971. The feeding habits of *Aedes simpsoni* in Uganda. East Afr. Virus Res. Inst. Rep. 20 (1970):49-52.

Pajot, F. X. 1976. Etude de l'ornementation des imagos d' *Aedes (Stegomyia) simpsoni* (Theobald, 1905) (Diptera, Culicidae) en Republique Centrafricaine. Cah. O.R.S.T.O.M., Ser. Entomol. Med. Parasitol. 14:201-7.

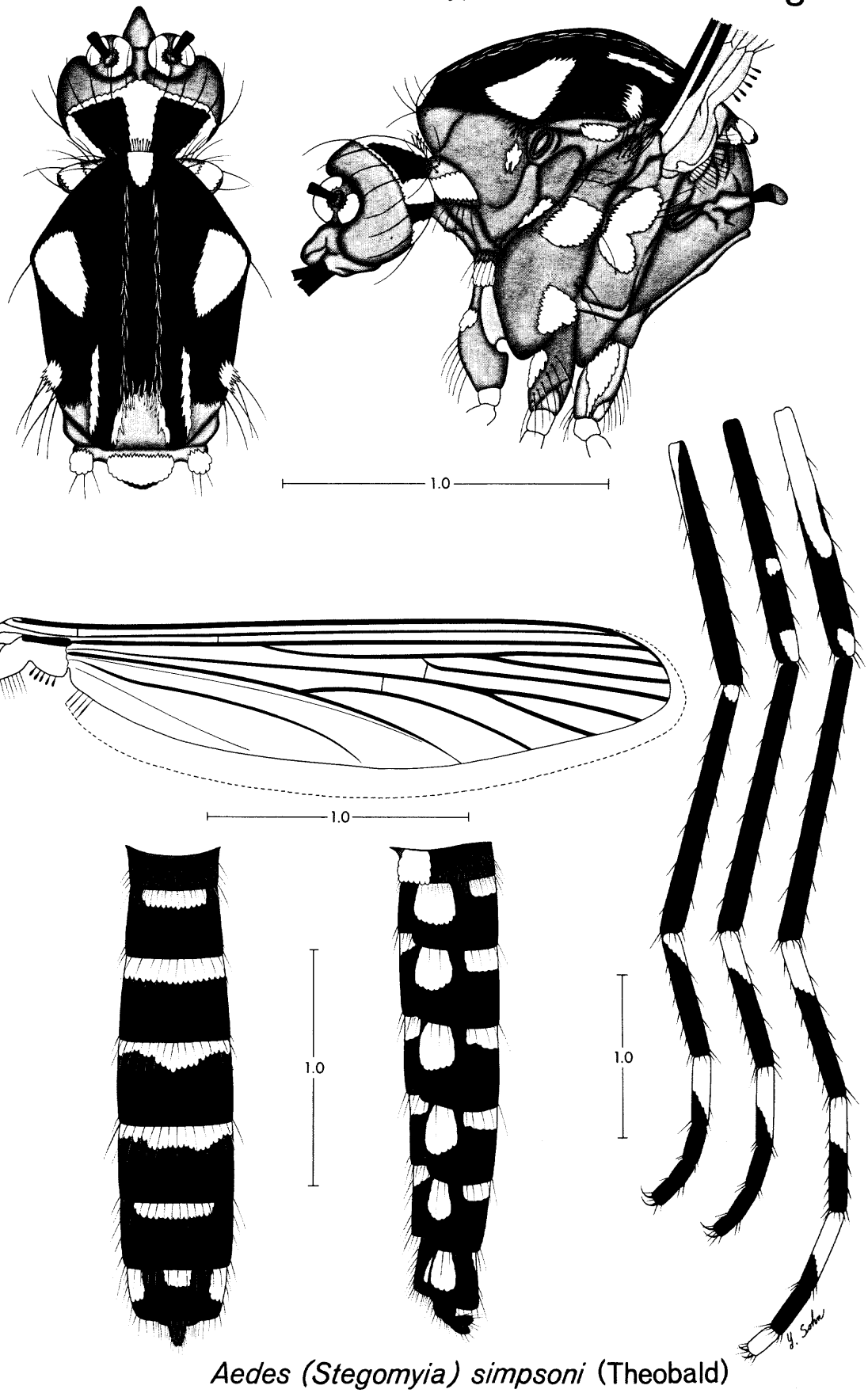
Theobald, F. V. 1905. A new *Stegomyia* from the Transvaal. Entomologist 38:224-5.

_____. 1910. A monograph of the Culicidae or mosquitoes. Vol. V, Br. Mus. (Nat. Hist.), London, 646 p.

_____. 1911. Uganda Culicidae including thirteen new species. Novae Culicidae. Part I, 35 p.

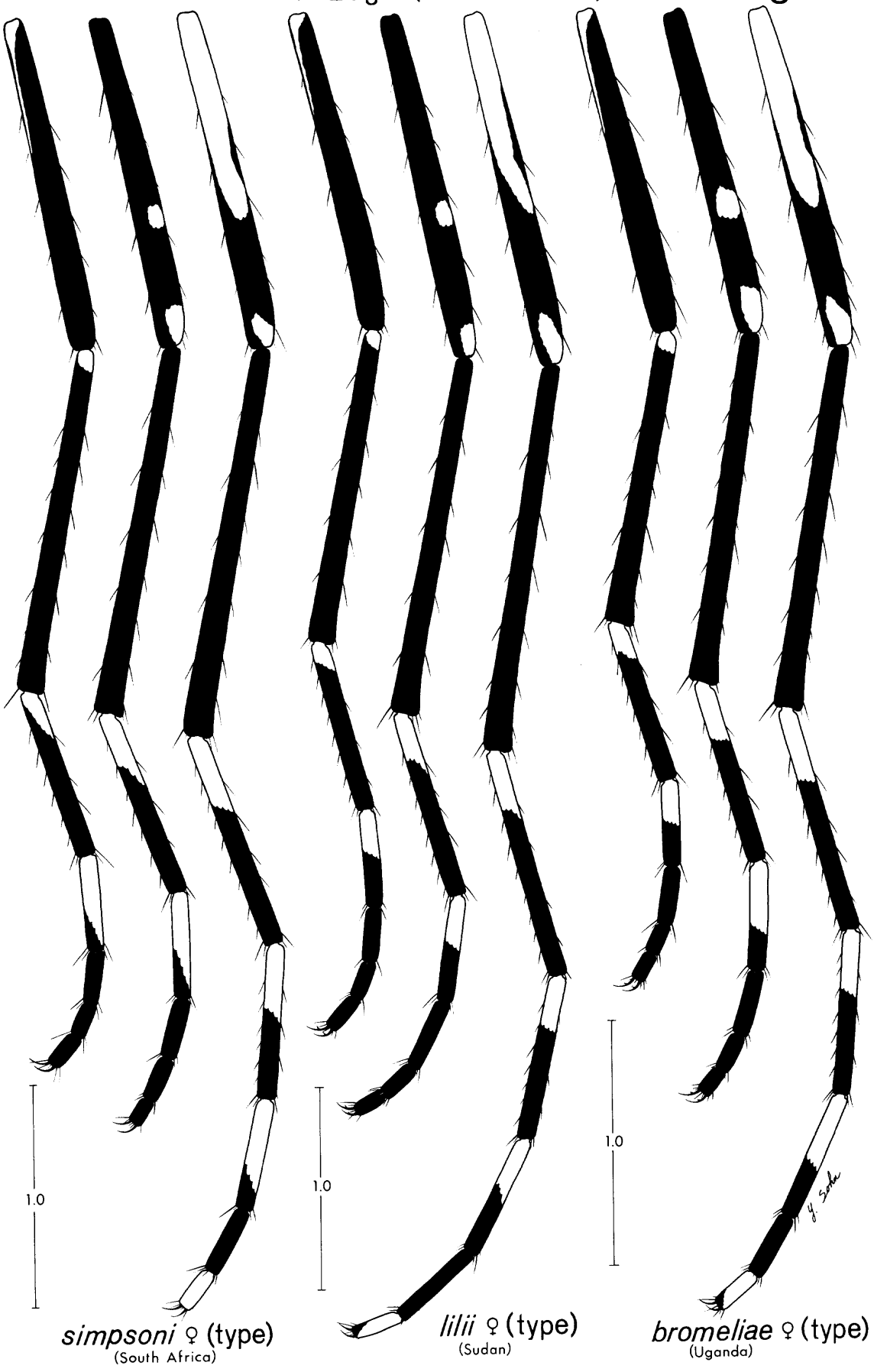
Lectotype ♀

Fig.1



Aedes (Stegomyia) simpsoni (Theobald)

Fig. 2


♀ Legs (anterior view)
1.0
1.0
1.0
simpsoni ♀ (type)
(South Africa)
lilii ♀ (type)
(Sudan)
bromeliae ♀ (type)
(Uganda)

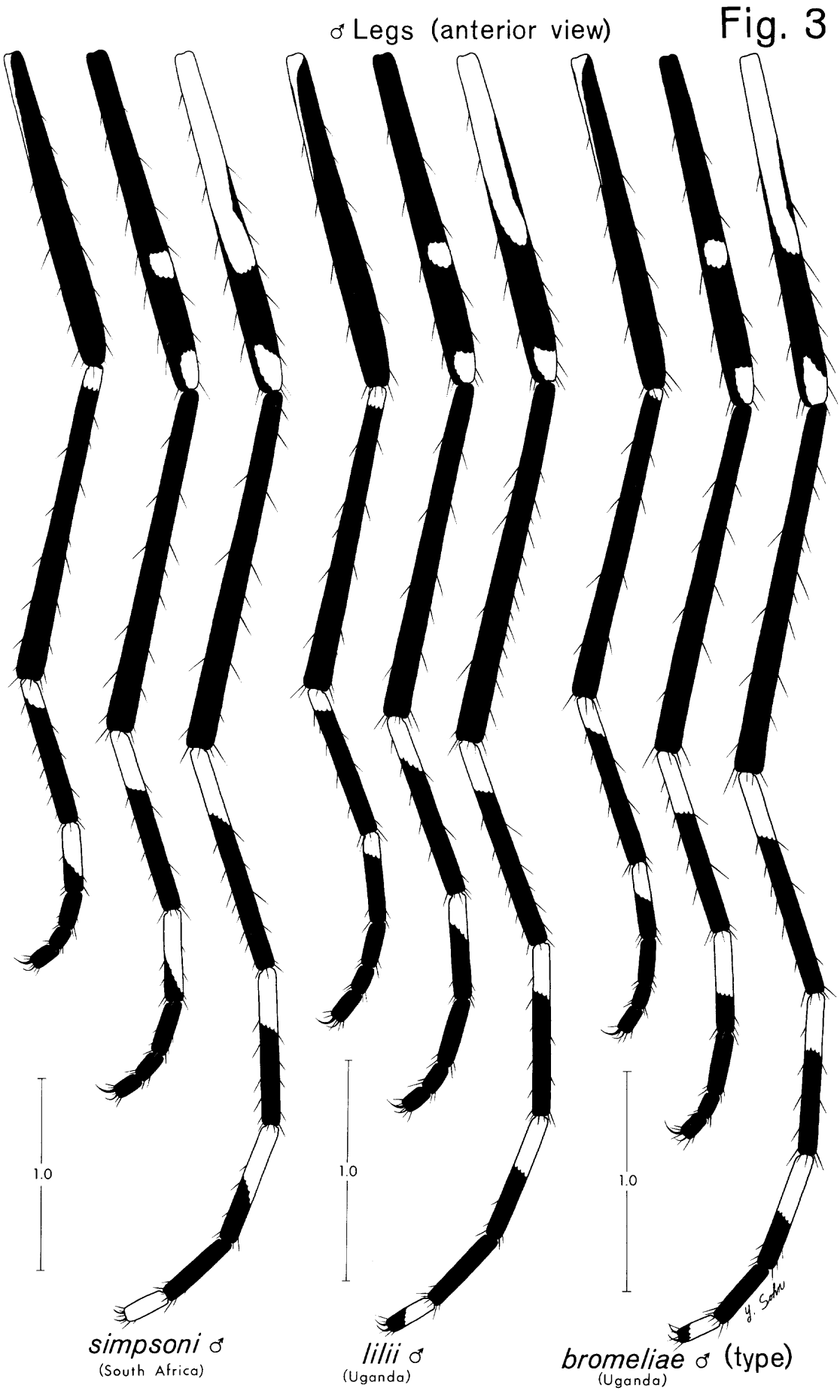

♂ Legs (anterior view)
Fig. 3
1.0
1.0
1.0
simpsoni ♂
(South Africa)
lilii ♂
(Uganda)
bromeliae ♂ (type)
(Uganda)

Fig. 4

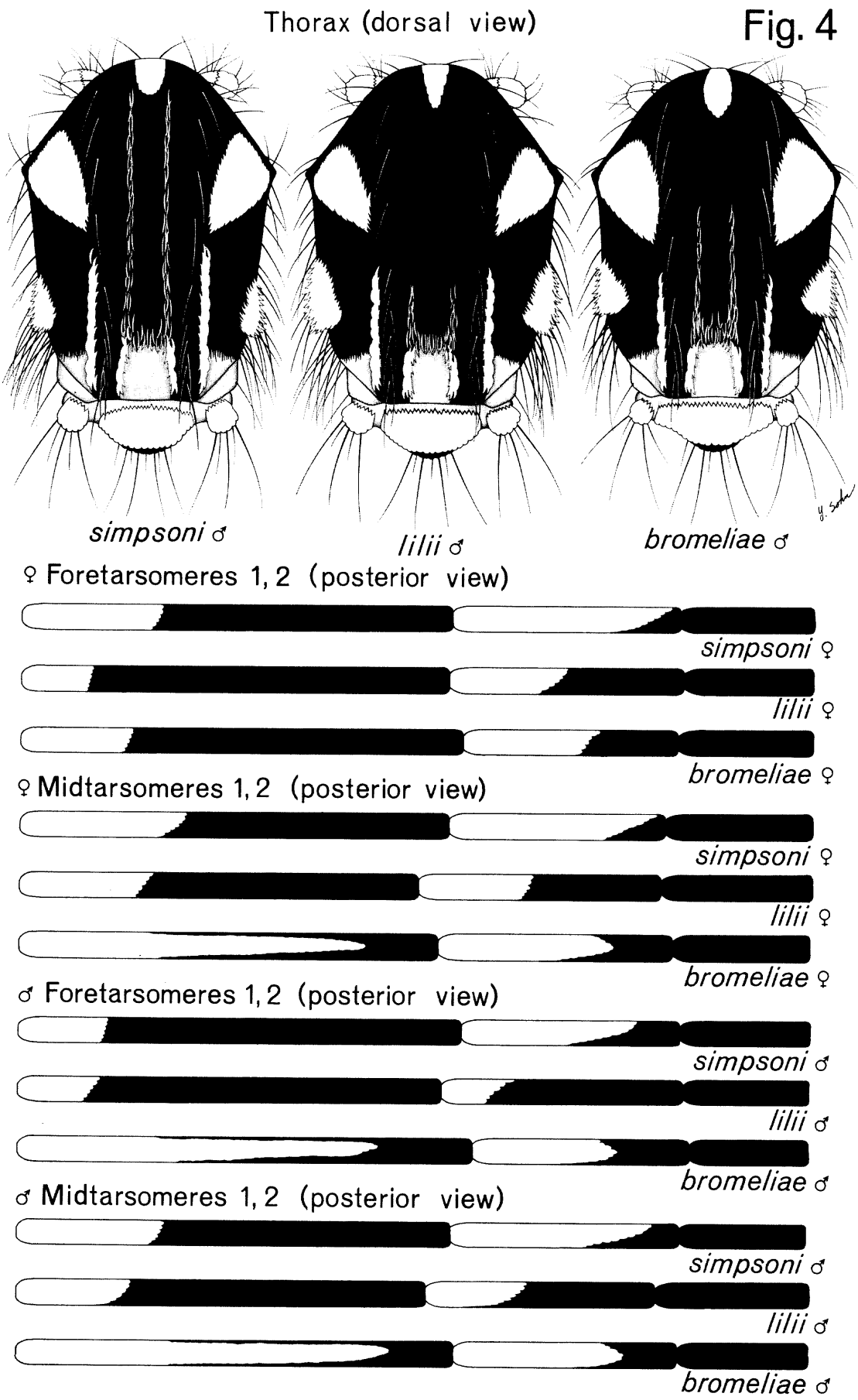
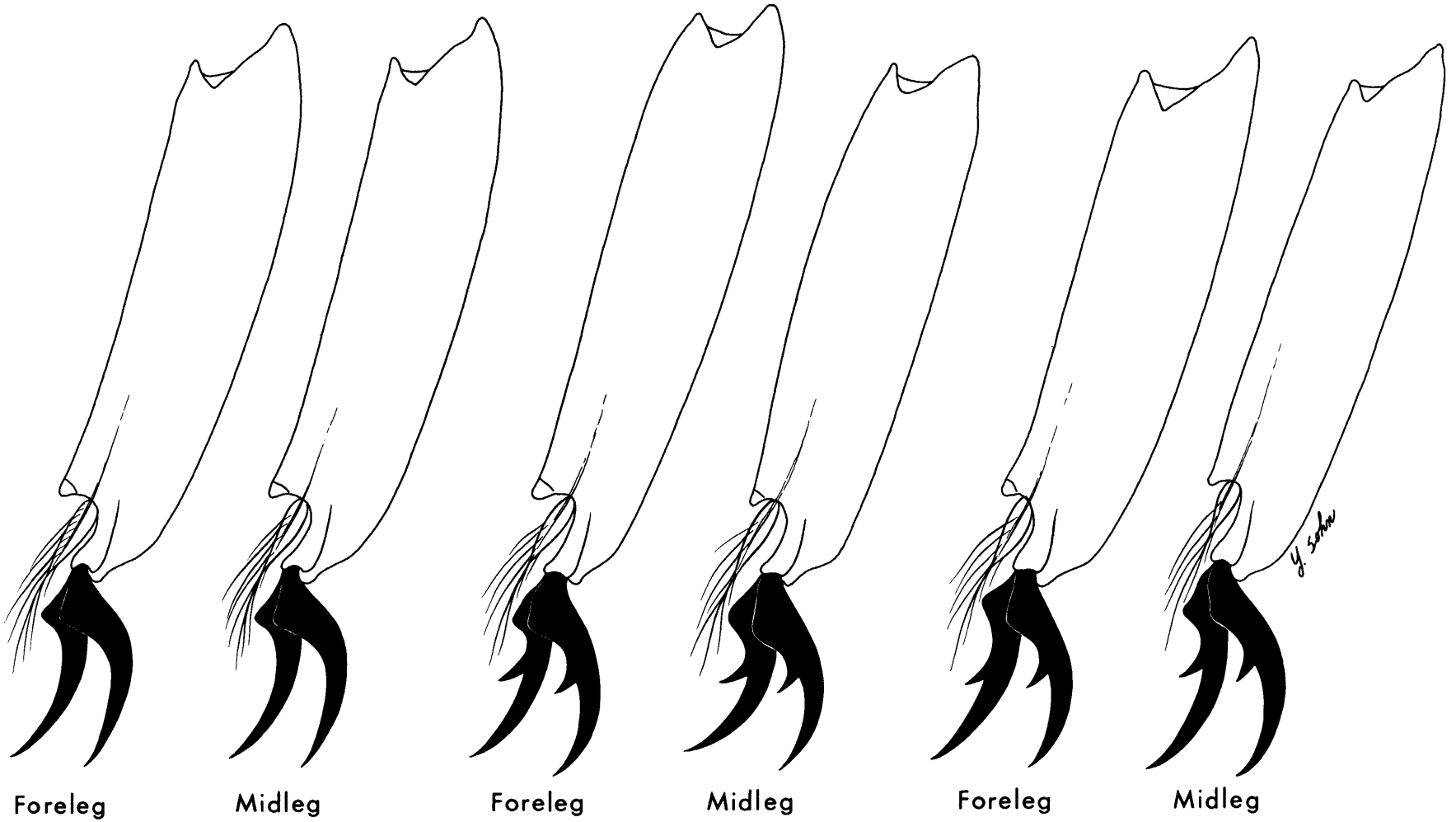

Thorax (dorsal view)
simpsoni ♂
lilii ♂
bromeliae ♂
♀ Foretarsomeres 1, 2 (posterior view)
simpsoni ♀
lilii ♀
bromeliae ♀
♀ Midtarsomeres 1, 2 (posterior view)
simpsoni ♀
lilii ♀
bromeliae ♀
♂ Foretarsomeres 1, 2 (posterior view)
simpsoni ♂
lilii ♂
bromeliae ♂
♂ Midtarsomeres 1, 2 (posterior view)
simpsoni ♂
lilii ♂
bromeliae ♂

Fig. 5

Tarsal claws



simpsoni ♀ *lilii* ♀ *bromeliae* ♀